

An ornithological survey of Vanuatu on the islands of Éfaté, Malakula, Gaua, and Vanua Lava

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Abstract

We surveyed forest birds on 4 islands in Vanuatu from November–December 2014, including sites on Éfaté, Malakula, Gaua, and Vanua Lava Islands. Here, we summarize our survey results and place them into the context of prior ornithological surveys in Vanuatu. We recorded 44 species across all survey sites, including eight species endemic to Vanuatu and another 6 species endemic to the region of Southern Melanesia. We collected voucher specimens of 26 species and made 98 recordings of vocalizations from 24 species. Malakula was the most diverse site we surveyed with 35 native species. We observed differences in breeding phenology across islands and between species within survey sites. There was more evidence of breeding by birds on Éfaté and Malakula than on Gaua and Vanua Lava. Finally, we present local bird names from each surveyed site as described by village elders and local guides.

Key words

Melanesia; tropical South Pacific; island biogeography; bird species inventory; Whitney South Sea Expedition.

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Introduction

Vanuatu is an oceanic island archipelago in Southern Melanesia that comprises more than 80 volcanic islands (Fig. 1). Oriented along the New Hebrides Arc, Vanuatu is positioned southeast of the Solomon Islands (1,290 km between capital cities, Honiara and Vila), about 500 km northeast of New Caledonia, and about 1,000 km west of Fiji. The New Hebrides Arc comprises all of Vanuatu plus Temotu Province, Solomon Islands, which is only 150–250 km north of Vanuatu's Torres Islands. Santo is Vanuatu's largest island (3,955 km²) and 13 additional

islands are greater than 100 km² (Nunn 1994).

The geologic history of Vanuatu is defined by three “belts” of islands representing different periods of orogeny (Mitchell and Warden 1971, Greene et al. 1988a, 1988b, Macfarlane 1988). The Western Belt includes Malakula and Santo Islands, whereas the Eastern Belt encompasses Maweo and Pentecost Islands. The Central Belt comprises the majority of islands from Temotu Province in the Solomon Islands south to Aneityum Island, Vanuatu. Beyond Aneityum, two small islands, Matthew and Hunter, form the southern terminus of the Central Belt. The oldest rocks in Vanuatu date from the Miocene

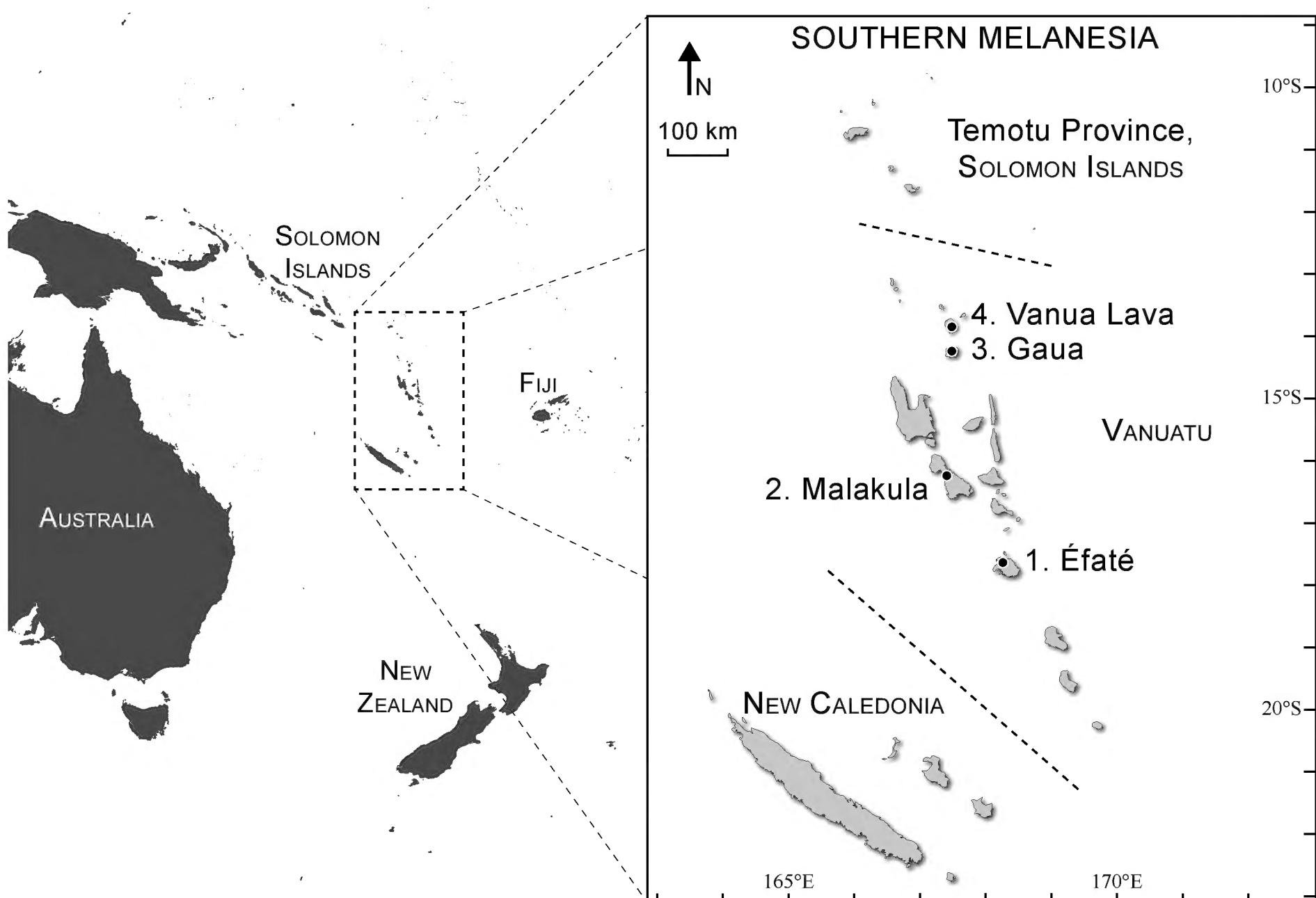


Figure 1. Map of Southern Melanesia, including from north to south, Temotu Province, Solomon Islands; Vanuatu; and New Caledonia (separated by dashed lines). Our 4 survey sites are marked with black circles and are labeled in chronological order of our survey: 1. Éfaté Island, 2. Malakula Island, 3. Gaua Island, and 4. Vanua Lava Island.

and occur in the Western and Eastern Belts (Macfarlane 1988). The Central Belt remains volcanically active and is composed of much younger rocks that range from modern to the Pliocene. The majority of Vanuatu's islands (e.g., those within the Central Belt) became subaerial 2–6 million years ago (Ma), but Santo and Malakula were subaerial more than 10 Ma (Greene et al. 1994).

The New Hebrides Arc is characterized by lowland and montane humid forest. Some islands have extensive closed-canopy coniferous forests (e.g., Santo, Erromango, and Aneityum) and cloud forest exists on Santo. Extensive mangrove forests occur on several islands, such as Malakula. Lowland forest throughout Vanuatu is under threat from local subsistence farming, slash-and-burn agriculture, and cattle grazing. Together, islands of the New Hebrides Arc comprise the *Vanuatu and Temotu Endemic Bird Area* (Stattersfield et al. 1998). There are 15 restricted-range species confined to this endemic bird area (EBA), with an additional 15 species present in other nearby EBAs (e.g., Solomon Group, New Caledonia, and Fiji). All restricted-range species are forest birds, thus, forest conservation in the New Hebrides Arc is a high priority for longevity of these species' populations.

There have been several ornithological inventories of Vanuatu. Tristram reported on collections from Vanuatu (New Hebrides) in the 1870s (Tristram 1876, 1879) and the American Museum of Natural History (AMNH) has

small collections from the 1870s and 1899–1901 by an unknown collector from the Rothschild collection (P. Sweet, pers. comm.). Additional small collections exist at AMNH from the Senckenburg Museum dating to the 1960s (P. Sweet, pers. comm.) and the Museum of Vertebrate Zoology at UC Berkeley collected in 1943–1944 by T. E. Reynolds and C. G. Sibley. The largest collection of Vanuatu birds—also curated at AMNH—is from the Whitney South Sea Expedition (WSSE; Murphy 1922; Chapman 1935; Bryan Jr. 1969). The WSSE conducted major ornithological expeditions in the archipelago, led by Rollo Beck from June 1926–January 1927 (Beck 1969). Beck was accompanied first by José G. Correia until 9 December 1926 and later by Frederick P. Drowne on 13 January 1927, just days before they left Vanuatu for the Solomon Islands (Correia 1969; Drowne 1969). The WSSE did not collect south of Éfaté, except for their first 6 days in Vanuatu after arriving from New Zealand. From 1935–1937, just after the WSSE concluded, Lindsay T. Macmillan collected specimens on Tanna, Erromango, and Aneityum (Bryan Jr. 1969); these specimens represent the only major collection of birds from the southern islands and are also housed at the AMNH.

Much of what we know about the status and distribution of Vanuatu's avifauna can be traced to these collections. Ernst Mayr published extensively on the systematics and distribution of Melanesian birds, with

numerous contributions focusing on the birds of Vanuatu (e.g., Mayr 1931, 1932a, 1932b, 1933, 1938, 1941). He synthesized this work with respect to the origin and biogeography of the Polynesian avifauna (Mayr 1940a, 1940b) and in a book that became the first field guide to the birds of the southwest Pacific (Mayr 1945). The Royal Society/Percy Sladen Expedition surveyed eleven sites on 6 islands in Vanuatu (Santo, Malakula, Éfaté, Erromango, Tanna, and Aneityum) with a focus on all terrestrial vertebrates (Medway and Marshall 1975). They surveyed birds with mist nets, but did not collect bird specimens. Their “observations confirmed the general picture of Mayr’s (1945) summary, and neither added to the species nor extended the known dates of their [WSSE] sojourn in the New Hebrides” (Medway and Marshall 1975:430). Bregulla (1992) later wrote a comprehensive book on the status and distribution of the birds of Vanuatu, and recently, a modern field guide to the birds of Melanesia—including Vanuatu—was written by Dutson (2011).

There have been several recent museum-based ornithological surveys in Vanuatu covering Santo (Kratter et al. 2006), as well as Éfaté, and Tanna (J. Kirchman, pers. comm.), which provided the first genetic samples from the archipelago and invaluable comparative material from those islands. However, the specimens collected by the WSSE remain the only comparative material from most islands in Vanuatu, with only minimal resurvey effort since WSSE. Few recordings exist of bird vocalizations of Vanuatu birds. Prior to our work, a combined total of 63 recordings were archived in the Macaulay Library and Xeno-canto. Additional audio material was recorded during bird surveys of Santo by Jennifer Bowen (Bowen 1997) and Andrew Kratter (Kratter et al. 2006) and are deposited in the British Library Sound Archive and the Florida Museum of Natural History Sound Archives, respectively. The relative paucity of rich media of Vanuatu birds is in stark contrast to nearby archipelagos like the Solomon Islands and Fiji, which have 1,068 and 648 archived recordings, respectively.

We surveyed select islands in Vanuatu to compile contemporary species lists and to collect modern comparative material. Here, we report results of an avifaunal survey of 4 islands in Vanuatu: Éfaté, Malakula, Gaua, and Vanua Lava. We surveyed birds by mist net captures, recording vocalizations, and passive observations, and we prepared museum voucher specimens and collected genetic samples for use in ongoing comparative projects. We compare our results to previous survey work in the archipelago and discuss relative abundance and evidence of breeding, including observed patterns of interisland differences in breeding phenology.

Methods

Study sites

Éfaté Island, Shéfa Province. We established a camp

on the border of Tukutuku Ranch, 4.2 km southeast of Port Havana on the northwest side of Éfaté (17.6029° S, 168.2827° E, 325 m elevation). [All coordinates in this paper are reported in WGS84.] We surveyed mature secondary forest with closed canopy (20–25 m high) and forest edge in dense shrubby vegetation among small patches of secondary forest from 18–21 November 2014. We cut a trail to access forested habitat from camp and we walked an existing jeep track 0.5 km south of camp that gave us access to similar secondary forest habitat. The forest understory was relatively open and easy to walk through at this site. Total mist net effort was 670.8 net-hours or 167.7 net-hours per day. Weather was generally moderate throughout our time with daytime high temperatures 25–28°C and nighttime lows 18–20°C; skies were mostly clear to partly cloudy with one brief rain shower on 18 November. Winds were calm 17–19 November, but breezy 20–21 November. Weather at this site never impeded our survey effort.

Malakula Island, Malampa Province. We established a camp along a dirt road 5.2 km southwest of Lingarak Village (16.2134° S, 167.4356° E, 100 m elevation) from 25–30 November 2014. We surveyed mature primary forest along two trails: a ridge trail above camp to approximately 330 m, and west along an overgrown jeep road from camp for 1.5 km. Understory vegetation throughout this tall primary forest (25 m canopy) was relatively open and easy to walk through. We also surveyed edge and garden habitats near camp, and a riparian forest with a flowing stream. Total mist net effort was 632.6 net-hours or 126.5 net-hours per day. Weather was generally hot during the day, with daytime highs approaching 30°C and lows near 20°C; skies were clear with no precipitation and winds were calm. Weather at this site never impeded on our survey effort.

Gaua Island, Torba Province. We established a camp on the east shore of Lake Letes (14.2747° S, 167.5488° E, 400 m elevation) from 3–6 December 2014. Lake Letes is 1 of approximately 25 freshwater lakes in Vanuatu, and the largest in the Southwest Pacific outside New Guinea, Australia, and New Zealand (Bregulla 1992). We surveyed premontane primary forest along a trail from the lakeshore to the old crater rim east of camp (470 m). The forest was closed canopy, but stunted compared to lowland forest nearer the coast. Canopy height was 15–20 m with 25-meter emergent canopy trees. The understory was dense with tree ferns and other woody vegetation. Most trees had at least some wet moss covering their trunks. Total mist net effort was 437.7 net-hours or 109.4 net-hours per day. We spent our last morning exploring the southeast slope of Mt. Gharat (spelled Garet on some maps), the active volcano on the west side of Lake Letes, but we did not collect or record bird songs there. Daytime high temperatures at our Lake Letes camp were approximately 18–20°C. A low cloud ceiling was trapped over Lake Letes with frequent rain showers that were heavy at times. The heaviest rain slowed our survey efforts for 1–3 hours each day.

Vanua Lava Island, Torba Province. We established a camp on a steep ridge trail 1.3 km northeast of Mosina Village in the southeast part of the island (13.8876° S, 167.5287° E, 350 m elevation). According to local villagers, our camp was the site of a Second World War, US military camp from 1942–1945. We surveyed pre-montane primary forest between 350–500 m from 9–11 December 2014. The forest canopy here was 15–20 m at camp, but shorter (12–15 m) on the ridge above camps at 500 m. The forest understory was fairly dense; more than the forests we surveyed on Éfaté and Malakula, but less than Gaua. Total mist net effort was 506.3 net-hours or 168.8 net-hours per day. Weather was moderate throughout our survey on Vanua Lava. The low pressure system that affected our work on Gaua cleared out and left clear skies with daytime high temperatures in the low 20s°C with light winds.

Data collection. We documented occurrences of upland forest bird species with voucher specimens, audio recordings, mist net captures, and observations at 4 sites on Éfaté, Malakula (spelled Malekula on some maps), Gaua, and Vanua Lava, Vanuatu (Fig. 1). Our mist net effort included 16–21 12-m mist nets that we opened from 05:00 h to 17:00 h daily, occasionally as early as 04:30 h and as late as 18:15 h (Table 1). We provide total and average daily mist net hours from each camp below. We focused mist net effort in primary forest, with fewer nets placed in edge or garden habitats with open canopy. Daily observations were made by the entire team and MJA recorded bird vocalizations using a Nagra ARES-BB+ digital audio recorder with a Telinga Pro6 stereo parabola.

We prepared specimens as dried round skins, spread-wings, complete or partial skeletons, and/or preserved whole in 10% formaldehyde. We preserved pectoral muscle tissue in 2 cryo-tubes, the first in liquid nitrogen, the second in 95% ethanol. We noted detailed information on each specimen, including collection date and locality, weight, sex and measurement of gonads, presence and measurement of bursa of Fabricius as a proxy for age (Glick et al. 1956), skull ossification, stomach and crop contents, fat condition, coloration of soft parts (e.g., iris, facial skin, bill, mouth lining, tarsus, and feet), and molt condition. These data are noted on specimen labels and are accessible via the AMNH Ornithology Department. We noted breeding evidence from specimens if females had yolking eggs, convoluted oviducts, or a brood patch and if males had enlarged testes or enlarged seminal vesicles. Behavioral evidence of breeding included male territorial vocalizations, adults seen feeding young, and active nests. We collected specimens under Scientific Collecting Permit No. ENV 314/014/2014/LF/tt administered by the Vanuatu Department of Environment and Conservation.

We deposited specimens at the American Museum of Natural History, New York, NY, USA, and in the Vanuatu Cultural Center, Port Vila, Vanuatu. Audio recordings are archived at the Macaulay Library, Cornell Laboratory of Ornithology, Ithaca, NY, USA and are available online (advanced search: Country: Vanuatu, Recordist: Michael J. Andersen; <http://www.macaulaylibrary.org>). Observational data are archived on eBird (<http://www.ebird.org>) and are available to download through the Avian Knowledge Network (<http://www.avianknowledge.net>). Taxonomy and nomenclature follows (Clements et al.

Table 1. Details of mist net hours at each of 4 survey sites. See text for total and mean daily mist net hours at each site.

Date (2014)	Mist net details
	Camp 1: VANUATU: Shéfa Province; Éfaté Island, 4.2 km SE Port Havana
18 Nov	Set 15 nets in mature secondary forest; all nets open by 10:00 h, closed at 14:00 h.
19 Nov	Opened 15 forest nets 05:00–15:30 h.
20 Nov	Opened 15 forest nets 05:00–17:15 h; set 4 nets in scrubby vegetation 08:30–17:30 h.
21 Nov	Opened 15 forest nets 05:00–16:55 h; 4 scrub nets 04:30–17:30 h; set one canopy net at forest edge 07:30–18:15 h.
	Camp 2: VANUATU: Malampa Province; Malakula Island, 5.2 km SW Lingarak Village
25 Nov	Set 11 nets in primary forest bordered by gardens 09:30–17:10 h.
26 Nov	Opened 11 primary forest nets 05:30–16:30 h; set 6 nets in secondary forest with gardens 09:00–16:30 h.
27 Nov	Opened 11 primary forest nets 04:30–15:00 h; opened 6 secondary forest nets 05:30–16:15 h; set one canopy net in secondary forest near camp.
28 Nov	Opened 5 primary forest nets 06:30–16:30 h, removed 6 primary forest nets; opened 6 secondary forest nets plus one canopy net 05:15–17:00 h; set one canopy net in garden near camp 15:30–17:15 h.
29 Nov	Removed remaining 5 forest nets; opened 5 secondary forest nets 05:15–15:30 h; set 4 nets in riparian forest 09:30–15:30 h, including one over a stream; set three garden nets 11:00–16:00 h.
	Camp 3: VANUATU: Torba Province; Gaua Island, E Shore Lake Letes
3 Dec	Set 11 nets in pre-montane primary forest 15:30–17:30 h.
4 Dec	Opened 11 forest nets 05:30–16:15 h.
5 Dec	Opened 11 forest nets 05:30–07:15 h; closed for rain until 09:30 h; opened until 16:30 h; set three forest nets, including one canopy net 10:00–17:00 h; set two forest edge nets next to camp 16:00–17:35 h.
6 Dec	Opened 13 forest nets 05:45–16:45 h; opened one forest canopy net 05:55–17:00 h; opened two forest edge nets 05:45–17:15 h.
	Camp 4: VANUATU: Torba Province; Vanua Lava Island, 1.3 km NE Mosina Village
9 Dec	Set 15 nets in primary forest on the trail above camp 12:15–16:45 h.
10 Dec	Opened 15 primary forest nets 05:30–16:30 h; set 4 additional primary forest nets upslope on the ridge trail 09:00–16:30 h.
11 Dec	Opened all 19 nets 05:45–17:30 h; set two more nets at 500 m elevation upslope on the ridge trail 07:00–17:15 h.

2016). Species identifications were made in the field using Dutson (2011) and verified using comparative material at the American Museum of Natural History, New York in consultation with P. Sweet.

Results

We documented 44 species of birds during our surveys (Table 2). Forty-one species are native and three are non-native (Red Junglefowl *Gallus gallus*, Common Myna *Acridotheres tristis*, and Common Waxbill *Estrilda astrild*); an additional three non-native species were observed in transit between survey sites and are discussed below. We observed an additional 8 species (5 native, 3 non-native) outside of our survey sites (see Table 2 footnotes for details). Site-specific diversity was highest on Malakula ($N = 35$ native species + 1 non-native), followed by Éfaté ($N = 28$ native species + 3 non-native), then Vanua Lava ($N = 27$ native species), and Gaua ($N = 26$ native species).

We prepared vouchered specimens at all 4 survey sites, including study skins, skeletons, and fluid-preserved anatomical specimens, all with associated genetic samples (Table A1). Site-specific numbers of collected species are as follows: Malakula (21 species); Éfaté (15 species); Vanua Lava (15 species); and Gaua (13 species). We archived 98 recordings of bird vocalizations from 28 species across all islands (Table A2). An additional 2 recordings remain unidentified (ML 515718, ML 515787); please contact MJA or the Macaulay Library if you can help identify them.

We discussed our survey results with village elders and guides, who in turn, provided local names for many bird species (Table A3). Discussion about local bird names involved examination of field guides with villagers, walking trails and bird-watching with local guides, and inspection of birds and specimens in the hand. The language of Lingarak Village, Malakula Island is *Never*; other language names were not noted.

Annotated list

We present an annotated list of select species including notes on systematics; relative abundance; breeding, molt, and diet; and the IUCN Red List conservation status (IUCN 2016). Taxonomy and nomenclature follows *The eBird/Clements Checklist of Birds of the World* (Clements et al. 2016). Identification of forest birds in Vanuatu generally is straightforward because most genera only have 1 representative in the entire country. Nevertheless, we discuss briefly the salient features used in field identification. We referenced Dutson (2011) in the field and comparative material in the American Museum of Natural History ornithology collection to help with identifications.

Megapodiidae

Megapodius layardi Tristram, 1879, Vanuatu Scrubfowl

We detected the endemic Vanuatu Scrubfowl only on Malakula Island in forest surrounding our camp. We heard them vocalizing on most days in the morning, and at least once an individual sang at night. MJA saw them once and made 2 recordings (Table A2). We identified Vanuatu Scrubfowl based on a slate-gray bird about the size and shape of a chicken, with a short tail and crest, red face, and stout yellow legs. Our guides showed us two eggs from an active nest mound near Lingarak Village, suggesting there is at least some egg-collecting pressure by villagers on Malakula. Egg harvesting—one of the most pressing influences on scrubfowl populations—is a concern elsewhere in Vanuatu (Bowen 1996, Foster 1999) where its IUCN status is Vulnerable.

Phasianidae

Gallus gallus (Linnaeus, 1758), Red Junglefowl

Accipitridae

Circus approximans Peale, 1848, Swamp Harrier

Rallidae

Gallirallus philippensis (Linnaeus, 1766), Buff-banded Rail

Charadriidae

Pluvialis fulva (Gmelin, 1789), Pacific Golden-Plover

Columbidae

Columba vitiensis Quoy & Gaimard, 1830, Metallic Pigeon

Macropygia mackinlayi Ramsay, 1878, Mackinlay's Cuckoo-Dove

Chalcophaps longirostris sandwichensis Gould, 1848, Pacific Emerald Dove

Ptilinopus tannensis (Latham, 1790), Tanna Fruit-Dove

Ptilinopus greyi Bonaparte, 1857a, Red-bellied Fruit-Dove: Figure 2A

Ducula pacifica (Gmelin, 1789), Pacific Imperial-Pigeon

Ducula bakeri (Kinnear, 1928), Baker's [Vanuatu] Imperial-Pigeon

The endemic Baker's Imperial-Pigeon is known from Santo Island and the Banks Group (Dutson 2011). We encountered this species in pre-montane primary forest near our camps on Gaua and Vanua Lava Islands. It was easily identified as a *Ducula* imperial-pigeon based on its large size. The plum-colored breast, chestnut underparts, and dark-gray upperparts were field marks used to identify this species from Pacific Imperial-Pigeon *Ducula pacifica*. The latter taxon was only observed in lowlands on Gaua and Vanua Lava, whereas we only saw *D. bakeri* at higher elevations. Birds on Gaua were difficult to detect because they were either scarce or not vocalizing

Table 2. Relative abundance of bird species recorded during our survey of Éfaté, Malakula, Gaua, and Vanua Lava Islands, Vanuatu. Relative abundances are listed for each island: common (C), observed numerous instances daily, usually less than 3 individuals; fairly common (F), observed almost daily or daily; uncommon (U), observed regularly, but only once every few (2–3) days; and rare/scarc (R), observed only a few times or less during survey effort. Species documented with voice recordings are marked with “v” (see Table A2) and those for which voucher specimens were collected are marked with “†” (see Table A1). Six non-native species are listed (Red Junglefowl, Rock Pigeon, Common Myna, House Sparrow, Common Waxbill, and Chestnut Munia), but note they are not counted in diversity metrics in the text. Species marked “*” were recorded from that island, but away from the survey site and are not counted in diversity metrics in the text. Details about these records are annotated with footnotes. Species marked “—” were not recorded. Taxonomy follows (Clements et al. 2016) and subspecies names are given for select taxa.

Family/English name	Species	Éfaté	Malakula	Gaua	Vanua Lava
Megapodiidae					
Vanuatu Scrubfowl	<i>Megapodius layardi</i>	—	U, v	—	R
Phasianidae					
Red Junglefowl [not native]	<i>Gallus gallus</i>	F	C	—	—
Phaethontidae					
White-tailed Tropicbird	<i>Phaethon lepturus</i>	*a	—	—	—
Ardeidae					
Pacific Reef-Heron	<i>Egretta sacra</i>	—	—	—	*b
Accipitridae					
Swamp Harrier	<i>Circus approximans</i>	R	U	R	R
Rallidae					
Buff-banded Rail	<i>Gallirallus philippensis</i>	F	F, †	U	U, †
Charadriidae					
Pacific Golden-Plover	<i>Pluvialis fulva</i>	R	*c	*d	—
Scolopacidae					
Wandering Tattler	<i>Tringa incana</i>	—	—	—	*e
Laridae					
Great Crested Tern	<i>Thalasseus bergii</i>	*f	—	—	—
Columbidae					
Rock Pigeon [not native]	<i>Columba livia</i>	*g	—	—	—
Metallic Pigeon	<i>Columba vitiensis</i>	C, v	U	—	—
Mackinlay’s Cuckoo-Dove	<i>Macropygia mackinlayi</i>	R	C, v, †	U	F, v, †
Pacific Emerald Dove	<i>Chalcophaps longirostris sandwichensis</i>	C, v, †	C, †	R, †	U, †
Tanna Fruit-Dove	<i>Ptilinopus tannensis</i>	F, v	U	R	—
Red-bellied Fruit-Dove	<i>Ptilinopus greyi</i>	C, v, †	C, †	U, †	F, †
Pacific Imperial-Pigeon	<i>Ducula pacifica</i>	U	C, v	U	U
Baker’s Imperial-Pigeon	<i>Ducula bakeri</i>	—	—	R	U
Cuculidae					
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	—	U, v	R	R
Tytonidae					
Barn Owl	<i>Tyto alba</i>	—	U, v	R	R
Apodidae					
Glossy Swiftlet	<i>Collocalia esculenta uropygialis</i>	C, †	C, †	F	U
White-rumped Swiftlet	<i>Aerodramus spodiopygius</i>	—	F, †	—	—
Uniform Swiftlet	<i>Aerodramus vanikorensis</i>	F, †	F	U	F
Alcedinidae					
Vanuatu Kingfisher	<i>Todiramphus farquhari</i>	—	F, v, †	—	—
Pacific Kingfisher	<i>Todiramphus sacer</i>				
	<i>T. s. juliae</i>	F, v, †	F, v, †	—	—
	<i>T. s. santoensis</i>	—	—	U, †	U, †
Falconidae					
Peregrine Falcon	<i>Falco peregrinus</i>	—	—	R	—
Psittaculidae					
Palm Lorikeet	<i>Charmosyna palmarum</i>	—	—	F, v, †	—
Rainbow Lorikeet	<i>Trichoglossus haematodus massena</i>	F, v	C, v, †	F, v	F
Meliphagidae					
Cardinal Myzomela	<i>Myzomela cardinalis</i>	U, †	C, †	C, v, †	F, v, †
Vanuatu Honeyeater	<i>Gliciphila notabilis</i>				
	<i>G. n. superciliaris</i>	—	F, v, †	—	—
	<i>G. n. notabilis</i>	—	—	R	F, v, †
Dark-brown Honeyeater	<i>Lichmera incana griseoviridis</i>	C, v, †	F, †	—	—
Acanthizidae					
Fan-tailed Gerygone	<i>Gerygone flavolateralis corraiae</i>	—	U	F, †	U

Continued

Table 2. Continued.

Family/English name	Species	Éfaté	Malakula	Gaua	Vanua Lava
Artamidae					
White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	F, v	U	*h	*i
Campephagidae					
South Melanesian Cuckooshrike	<i>Coracina caledonica</i>	—	R, v	—	—
Polynesian Triller	<i>Lalage maculosa</i>	U, v	R	—	—
Long-tailed Triller	<i>Lalage leucopyga</i>	C, v	F	U	U
Pachycephalidae					
Vanuatu Whistler	<i>Pachycephala chlorura intacta</i>	C, v, †	C, v, †	U, †	U, †
Rhipiduridae					
Streaked Fantail	<i>Rhipidura verreauxi spilodera</i>	C, v, †	C, v, †	C, †	C, †
Gray Fantail	<i>Rhipidura albiscapa brenchleyi</i>	F, v	—	*j	*k
Monarchidae					
Buff-bellied Monarch	<i>Neolalage banksiana</i>	F, v, †	F, v, †	—	F, v, †
Southern Shrikebill	<i>Clytorhynchus pachycephaloides griseus</i>	—	U, v, †	U, †	U, †
Melanesian Flycatcher	<i>Myiagra caledonica marinae</i>	F, v, †	U, v, †	—	U, †
Petroicidae					
Pacific Robin	<i>Petroica multicolor</i>				
	<i>P. m. feminina</i>	U, v, †	—	—	—
	<i>P. m. ambrynnensis</i>	—	U, †	R, †	—
	<i>P. m. soror</i>	—	—	—	R, †
Hirundinidae					
Pacific Swallow	<i>Hirundo tahitica</i>	*l	R	—	—
Zosteropidae					
Silver-eye	<i>Zosterops lateralis</i>	U, †	R	*m	—
Yellow-fronted White-eye	<i>Zosterops flavifrons</i>				
	<i>Z. f. efatensis</i>	C, v, †	—	—	—
	<i>Z. f. macgillivrayi</i>	—	C, v, †	—	—
	<i>Z. f. gauensis</i>	—	—	F, †	—
	<i>Z. f. perplexa</i>	—	—	—	F, †
Turdidae					
Island Thrush	<i>Turdus poliocephalus</i>				
	<i>T. p. efatensis</i>	U, v, †	—	—	—
	<i>T. p. malekulae</i>	—	F, v, †	—	—
	<i>T. p. whitneyi</i>	—	—	U, †	—
	<i>T. p. placens</i>	—	—	—	R, †
Sturnidae					
Common Myna [not native]	<i>Acridotheres tristis</i>	F, v	—	—	—
Passeridae					
House Sparrow [not native]	<i>Passer domesticus</i>	*n	—	—	—
Estrildidae					
Common Waxbill [not native]	<i>Estrilda astrild</i>	U*	—	—	—
Blue-faced Parrotfinch	<i>Erythrura trichroa</i>	R	—	—	—
Royal Parrotfinch	<i>Erythrura regia regia</i>	—	—	R, †	—
Chestnut Munia [not native]	<i>Lonchura atricapilla</i>	—	*o	—	—

^a Pair seen flying high over Port Vila (22 November 2015; 17.7316° S, 168.3126° E).

^b One dark-morph seen in Mosina Village, Vanua Lava (12 December 2014; 13.8983° S, 167.5338° E).

^c One seen at Norsup airstrip, Malakula (2 December 2014; 16.0813° S, 167.4036° E).

^d Twenty-one seen flying over runway at Gaua airstrip (2 December 2014; 14.2202° S, 167.5881° E).

^e One seen in Sola, Vanua Lava (12 December 2014; 13.8726° S, 167.5502° E).

^f Two seen from the Port Vila waterfront, Éfaté (16 December 2014; 17.7378° S, 168.3127° E).

^g Small groups (*N* = 1–3) seen in Port Vila, Éfaté.

^h Eight seen at the Gaua airstrip (2 December 2014; 14.2202° S, 167.5881° E) and 2 seen from the Canterbury College Guest House (7 December 2014; 14.2116° S, 167.5680° E).

ⁱ Two seen in Sola, Vanua Lava (8 December 2014; 13.8726° S, 167.5502° E).

^j Four seen at the Canterbury College Guest House (7 December 2014; 14.2116° S, 167.5680° E).

^k Two seen in Mosina Village, Vanua Lava (12 December 2014; 13.8983° S, 167.5338° E) and 2 seen in Sola, Vanua Lava (12 December 2014; 13.8726° S, 167.5502° E).

^l Seen frequently in small numbers (*N* = 2–6 birds) from the Port Vila waterfront, Éfaté (17.7378° S, 168.3127° E).

^m Twenty seen at the Gaua airstrip (2 December 2014; 14.2202° S, 167.5881° E) and 5 seen at the Canterbury College Guest House (7 December 2014; 14.2116° S, 167.5680° E).

ⁿ Seen frequently in small numbers (*N* = 2–8 birds) from the Port Vila waterfront, Éfaté (17.7378° S, 168.3127° E).

^o One seen at Norsup airstrip, Malakula (23 November 2014; 16.0813° S, 167.4036° E) and 7 seen there on 2 December 2014.



Figure 2. Photos of birds mistnetted during our survey of Vanuatu: **A.** Red-bellied Fruit-Dove *Ptilinopus greyi*. **B.** Vanuatu Kingfisher *Todiramphus farquhari*. **C.** Pacific Kingfisher *Todiramphus sacer*. **D.** Pacific Kingfisher *Todiramphus sacer*. **E.** Palm Lorikeet *Charmosyna palmarum*. **F.** Cardinal Myzomela *Myzomela cardinalis*. **G.** Vanuatu Honeyeater *Gliciphila notabilis superciliaris*. **H.** Vanuatu Honeyeater *Gliciphila notabilis notabilis*.

frequently. Conversely, birds on Vanua Lava were vocalizing, which made detection easier. Kratter et al. (2006) experienced similar ease of detection of vocalizing birds at about 600 m elevation on Santo. Its IUCN status is Vulnerable.

Cuculidae

Chrysococcyx lucidus (Gmelin, 1788), Shining Bronze-Cuckoo

Tytonidae

Tyto alba (Scopoli, 1769), Barn Owl

Apodidae

Collocalia esculenta (Linnaeus, 1758), Glossy Swiftlet

Aerodramus spodiopygius (Peale, 1848), White-rumped Swiftlet

Aerodramus vanikorensis (Quoy & Gaimard, 1830), Uniform Swiftlet

Alcedinidae

Todiramphus farquhari (Sharpe, 1899), Vanuatu Kingfisher: Figure 2B

The Vanuatu Kingfisher (Fig. 2B) is endemic to Santo, Malo, and Malakula islands. We detected it daily in and around our camp on Malakula. It was active vocally throughout the day, including at least 1 that we heard daily from camp. Daily counts ranged from 2–7 individuals. Its IUCN status is Near Threatened. At least 1 specimen collected on 27 November 2014 showed evidence of breeding, a female with a convoluted oviduct and a 2×2 mm yolk. No molting was evident and 2 specimens had stomach contents of large arthropods.

Vanuatu Kingfisher is 1 of 2 *Todiramphus* kingfishers on Malakula where it is sympatric with Pacific Kingfisher, *Todiramphus sacer* (Dutson 2011). This is one of only a few examples of sympatric *Todiramphus* kingfisher pairs anywhere in the Pacific (Andersen et al. 2015). Prevailing wisdom suggests these sympatric species segregate by habitat, whereby one is more likely to be found in the island's interior and the other occupies edge or coastal habitat (Bregulla 1992, Pratt and Etpison 2008); however, we observed both Vanuatu Kingfisher and Pacific Kingfisher *Todiramphus sacer* occurring together in and around our Malakula camp. These species were easy to separate because *T. farquhari* has rich rufous-orange underparts and navy blue upperparts with a white collar, compared to whitish underparts and sea blue-green upperparts of *T. sacer*.

Todiramphus sacer (Gmelin, 1788), Pacific Kingfisher: Figure 2C, D

Pacific Kingfisher is a widespread species from the eastern Solomon Islands to Samoa and Tonga. It was recently recognized as a species separate from the polytypic Collared Kingfisher, *Todiramphus chloris* com-

plex (Andersen et al. 2015). Twenty-two subspecies are described, of which 5 occur in Vanuatu (Clements et al. 2016). Our survey recorded 2 subspecies: *juliae* on Éfaté (Fig. 2C) and Malakula (Fig. 2D) and *santoensis* on Gaua and Vanua Lava. All *T. sacer* have whitish underparts and blue-green upperparts, making identification easy; however, plumage is variable between subspecies so our subspecific identifications were based on known allopatric distributions on specific islands. Pacific Kingfisher was common throughout and they occurred from the coastal scrub to interior forest, including in villages. Its IUCN status is Least Concern. MJA observed 1 individual leaving a nest cavity in a rotting log near our camp on Éfaté, 21 November 2014. Numerous specimens of *T. s. juliae* had enlarged gonads, but gonads on *T. s. santoensis* specimens showed no signs of breeding. Minimal molt was noted in these specimens and stomach contents included large arthropods, plus 1 individual from Éfaté with lizard bones.

Falconidae

Falco peregrinus Tunstall, 1771, Peregrine Falcon

Psittaculidae

Charmosyna palmarum (Gmelin, 1788), Palm Lorikeet: Figure 2E

The Palm Lorikeet is endemic to Vanuatu and Temotu Province, Solomon Islands. We recorded this species only on Gaua Island, where it was fairly common. We noted it flying through camp daily and we observed small flocks (2–6 birds) foraging in a flowering palm near camp. Only 2 lorikeet species are known from Vanuatu: *Charmosyna palmarum* and Rainbow Lorikeet (*Trichoglossus haematodus*). The *Charmosyna* is easily identified by its smaller size and entirely green plumage, which makes it unmistakable from the sympatric and multicolored *T. haematodus*. Furthermore, its vocalizations are higher-pitched and less full-bodied compared to, which made them readily identifiable by voice. Palm Lorikeet is a nomadic species that undergoes population fluctuations (Medway and Marshall 1975, Bregulla 1992). Apparently, it is now most regularly seen in the Banks Group (Dutson 2011), which fits the pattern of our only sightings on Gaua. Its IUCN status is Vulnerable. Four specimens exhibited light body molt, heavy fat loads, and stomach contents of flower parts.

Trichoglossus haematodus massena (Linnaeus, 1771), Rainbow Lorikeet

Meliphagidae

Myzomela cardinalis (Gmelin, 1788), Cardinal Myzomela: Figure 2F

Gliciphila notabilis (Sharpe, 1899), Vanuatu Honeyeater: Figure 2G, H

The Vanuatu Honeyeater is endemic to northern Vanuatu, from Epi north to Ureparapara Island in the

Banks Group. This species has 2 described subspecies (*notabilis* in the north, *superciliaris* in the south; Dutson 2011). We observed it as fairly common only in large tracts of forest on Malakula (*superciliaris*; Fig. 2G) and Vanua Lava (*notabilis*; Fig. 2H), where it congregated in small groups of 3–10 birds in flowering trees. This observation was particularly evident on Vanua Lava where flocks were gregarious and noisy at dawn and dusk. Kratter et al. (2006) observed similar behavior on Santo Island. *Gliciphila notabilis* is the largest of 3 honeyeater (Meliphagidae) species in Vanuatu. It is a medium-sized, brown-and-white passerine with a salt-and-peppered face and decurved black bill. Its IUCN status is Least Concern. Of 3 specimens of *notabilis*, 2 had moderate to heavy fat loads and exhibited wing and body molt. All 3 had stomach contents of insects. One female had a convoluted oviduct, but with small follicles on 10 December 2014; others showed no signs of breeding evidence.

Curiously, Vanuatu Honeyeater is not known from Gaua Island, but MJA heard 1 bird on 4 December 2014 believed to be this species. It was vocalizing on the east shore of Lake Letes in pre-montane primary forest. Unfortunately, it was not seen and no concrete evidence was garnered; thus, we treat this record as provisional.

Lichmera incana griseoviridis (Latham, 1790), Dark-brown Honeyeater: Figure 3A

Acanthizidae

Gerygone flavolateralis (Gray, 1859), Fan-tailed Gerygone: Figure 3B

Artamidae

Artamus leucorhynchus (Linnaeus, 1771), White-beasted Woodswallow

Campephagidae

Coracina caledonica (Gmelin, 1788), South Melanesian Cuckooshrike

Lalage maculosa (Peale, 1848), Polynesian Triller

Lalage leucopyga (Gould, 1838), Long-tailed Triller

Pachycephalidae

Pachycephala chlorura intacta Gray, 1860, Vanuatu [Melanesian] Whistler: Figure 3C–D

The polytypic Vanuatu Whistler (Fig. 3C, D) was common at our Éfaté and Malakula sites and uncommon at both of our Banks Group sites. Vanuatu Whistlers are easily identifiable based on their bright yellow underparts with a white throat delineated by a black collar and head. Superficially, they are similarly patterned to *Neolalage banksiana*; but the latter has extensive white in the tail, rump, and wings, whereas whistlers are uniformly dark green on the back. Female whistlers are muted versions of males with olive-brown backs, dull yellow underparts

and a dingy white throat. Whistlers have characteristic loud vocalizations that make them easy to detect when singing. Birds on Éfaté and Malakula were singing vociferously, but were quiet on Gaua and Vanua Lava, making them more difficult to detect. Several lines of breeding evidence were noted on Éfaté and Malakula, including a female on Éfaté observed feeding a recently fledged young (21 November 2014), multiple male specimens with enlarged testes and seminal vesicles and females with convoluted oviducts, and singing males. Only 1 specimen showed signs of molt (Malakula). Conversely, specimens from Gaua and Vanua Lava were largely not in breeding condition and most were in body, wing, and tail molt. Stomach contents of all specimens were invariably of arthropods.

The Vanuatu Whistler has 4 subspecies (Clements et al. 2016). All our surveys were within the distribution of *P. c. intacta*, whereas 3 others occur in the south (*chlorura* on Erromango, *cucullata* on Anytiem, and *littayei* on the Loyalty Islands, New Caledonia). The taxonomic assignment of these 4 subspecies to Vanuatu Whistler is equivocal and may represent multiple species (Jönsson et al. 2014). Its IUCN status is Least Concern. Further survey work should focus on the southern subspecies so that these are represented in global tissue collections.

Rhipiduridae

Rhipidura verreauxi spilodera Marie, 1870, Streaked Fantail: Figure 3E

Streaked Fantail was one of the most common and widespread understory forest birds we observed (Fig. 3E). It was the most frequently captured bird in mist nests on all 4 islands we surveyed. Indeed, it was common throughout and its IUCN status is Least Concern. It is a small, brownish passerine with a long, broadly fanned tail. Underparts are paler with bold, blurry streaking on the breast, separated by a white throat. Its face is black accented by white loreal and post-ocular stripes. Its only congener in Vanuatu, Gray Fantail (*R. albiscapa*) has yellow underparts with a broad black breast band. These 2 species segregated by habitat preference: *R. verreauxi* was found exclusively in forest, whereas *R. albiscapa* was in forest edge, second growth, and villages. Streaked Fantail was a highly vocal component of the dawn chorus with its high-pitched, whistled song. Multiple male specimens throughout the survey had enlarged testes and seminal vesicles and females had convoluted oviducts; however, breeding evidence in specimens from Vanua Lava was less pronounced (e.g., smooth ovaries and straight oviducts in all females examined).

Rhipidura albiscapa Gould, 1840, Gray Fantail

Monarchidae

Neolalage banksiana Matthews, 1928, Buff-bellied Monarch: Figure 3F

The Buff-bellied Monarch is in a monotypic genus



Figure 3. Photos of birds mistnetted during our survey of Vanuatu: **A.** Dark-brown Honeyeater *Lichmera incana*. **B.** Fan-tailed Gerygone *Gerygone flavolateralis*. **C.** Vanuatu Whistler *Pachycephala chlorura* (male). **D.** Vanuatu Whistler *Pachycephala chlorura* (female). **E.** Streaked Fantail *Rhipidura verreauxi*. **F.** Buff-bellied Monarch *Neolalage banksiana*. **G.** Southern Shrikebill *Clytorhynchus pachycephaloides* (adult). **H.** Southern Shrikebill *Clytorhynchus pachycephaloides* (immature).

that is endemic to Vanuatu (Fig. 3F). It occurs from Éfaté north to the Banks Group and its IUCN status is Least Concern. Individuals were easily identified by their striking black-and-white plumage with yellow underparts. Female plumage was slightly muted compared to males. This unmistakably plumaged monarch-flycatcher was fairly common in forest understory at all sites except Gaua. The distribution of Buff-bellied Monarch mirrors closely that of Vanuatu Honeyeater, *Gliciphila notabilis* (with the exception of Éfaté), and it is curious that both are absent from Gaua. We observed them, often in vine tangles, in pairs or small family groups and they were frequently heard calling. The call is a long, quavering whistle similar to that given by *Clytorhynchus* shrikebills. Indeed, where these species overlapped, it was difficult to separate them by this call. Additionally, they gave a harsh, chattering call (e.g., see Macaulay Library 515702). Kratter et al. (2006) described a melodious song from Santo Island, but we never knowingly heard this vocalization. Many specimens showed evidence of breeding, including male specimens with enlarged testes and seminal vesicles and females with convoluted oviducts, suggesting recent or ongoing breeding. Stomach contents included arthropods and only 1 specimen, a female from Vanua Lava, was observed in molt (primaries).

Clytorhynchus pachycephaloides Elliot, 1870, Southern Shrikebill: Figure 3G, H

The Southern Shrikebill occurs in Vanuatu and New Caledonia (Fig. 3G). The Vanuatu subspecies (*grisce-cens*) is found on most islands in the country, including throughout the Banks and Torres groups; however, it is absent from Tanna and Aneityum in the far south, as well as Ambrym in the heart of the archipelago. It is a bird of forest understory where it forages for insects in vine tangles. It is a medium-sized, uniformly brown passerine with a large, gray, hooked bill and dingy white tail tips. Its IUCN status is Least Concern. We observed it in 3 of our 4 survey sites. Curiously, we did not detect it on Éfaté where the WSSE collected 12 Southern Shrikebill in June and July 1926. The whistled vocalizations are similar to those of Buff-bellied Monarch so it is plausible we overlooked vocal birds on Éfaté. We had no trouble locating and capturing multiple individuals at our 3 subsequent camps on Malakula, Gaua, and Vanua Lava, which suggests it was at least inconspicuous or locally absent on Éfaté. Both male specimens from Malakula had enlarged testes and seminal vesicles with no evidence of molt, suggesting they were in breeding condition. Our observations on Gaua suggested birds had just completed nesting. We observed several family groups, including juveniles with black bills and yellow gape flanges (Fig. 3H) and 1 specimen had a bursa of Fabricius (9×3 mm). Three Gaua specimens were in molt. Stomach contents included arthropods.

Myiagra caledonica Bonaparte, 1857b, Melanesian Flycatcher: Figure 4A, B

Petroicidae

Petroica multicolor Peale, 1848, Pacific Robin: Figure 4C, D

The Pacific Robin is a widespread, polytypic taxon that occurs from the Solomon Islands to Samoa. It is easily identifiable based on its tiny size and generally black-and-red plumage with pale forehead and wing patch. Only Cardinal Myzomela (*Myzomela cardinalis*) is superficially similar in plumage, but *M. cardinalis* has a relatively long, decurved bill, whereas Pacific Robin has a much shorter, straight bill. Its IUCN status is Least Concern. Five subspecies occur in Vanuatu and we recorded 3 during our survey. *Petroica multicolor feminina*, so named because males have female-like plumage (Fig. 4C), is endemic to Éfaté; *P. m. ambrynensis* is widespread across central Vanuatu (Malakula and Gaua on our survey; Fig. 4D); and *P. m. soror* is endemic to Vanua Lava. We found Pacific Robins to be uncommon on Éfaté and Malakula and rare on Gaua and Vanua Lava. Individuals on Éfaté were vocal and specimens of males had enlarged gonads and seminal vesicles. A female on Gaua had 4 yolks (largest 4 mm). No specimens were molting and stomach contents were arthropods.

Hirundinidae

Hirundo rustica Linnaeus, 1758, Pacific Swallow

Zosteropidae

Zosterops lateralis (Latham, 1801), Silver-eye

Zosterops flavifrons (Gmelin, 1789), Yellow-fronted White-eye: Figure 4E

Yellow-fronted White-eye is a Vanuatu endemic (Fig. 4E). It was among the most common birds we observed at all of our survey sites. On Éfaté and Malakula daily counts were from 15–25, whereas counts on Gaua and Vanua Lava ranged from 2–10. Indeed, the IUCN Red List status is Least Concern. Yellow-fronted White-eye was easily identified by its small size and uniformly greenish-yellow plumage with bold white eye ring. Its only congener in Vanuatu, Silver-eye (*Z. lateralis*), has mostly white underparts with yellow restricted to the throat and undertail coverts. Seven subspecies of *Z. flavifrons* are described, of which we observed 4: *Z. f. efatensis* (Éfaté), *Z. f. macgillivrayi* (Malakula), *Z. f. gauensis* (Gaua), *Z. f. perplexus* (Vanua Lava). Specimens from all for survey sites showed evidence of breeding. For example, males had enlarged testes and seminal vesicles and some females had enlarged oviducts and were yolking. Birds on Éfaté comprised a major component of the dawn chorus, but vocal activity at dawn was subdued elsewhere. Most specimens showed no evidence of molt (only a few showed minimal body molt) and stomach contents were mostly small seeds and other plant matter.

Turdidae

Turdus poliocephalus Latham, 1801, Island Thrush: Figure 4F

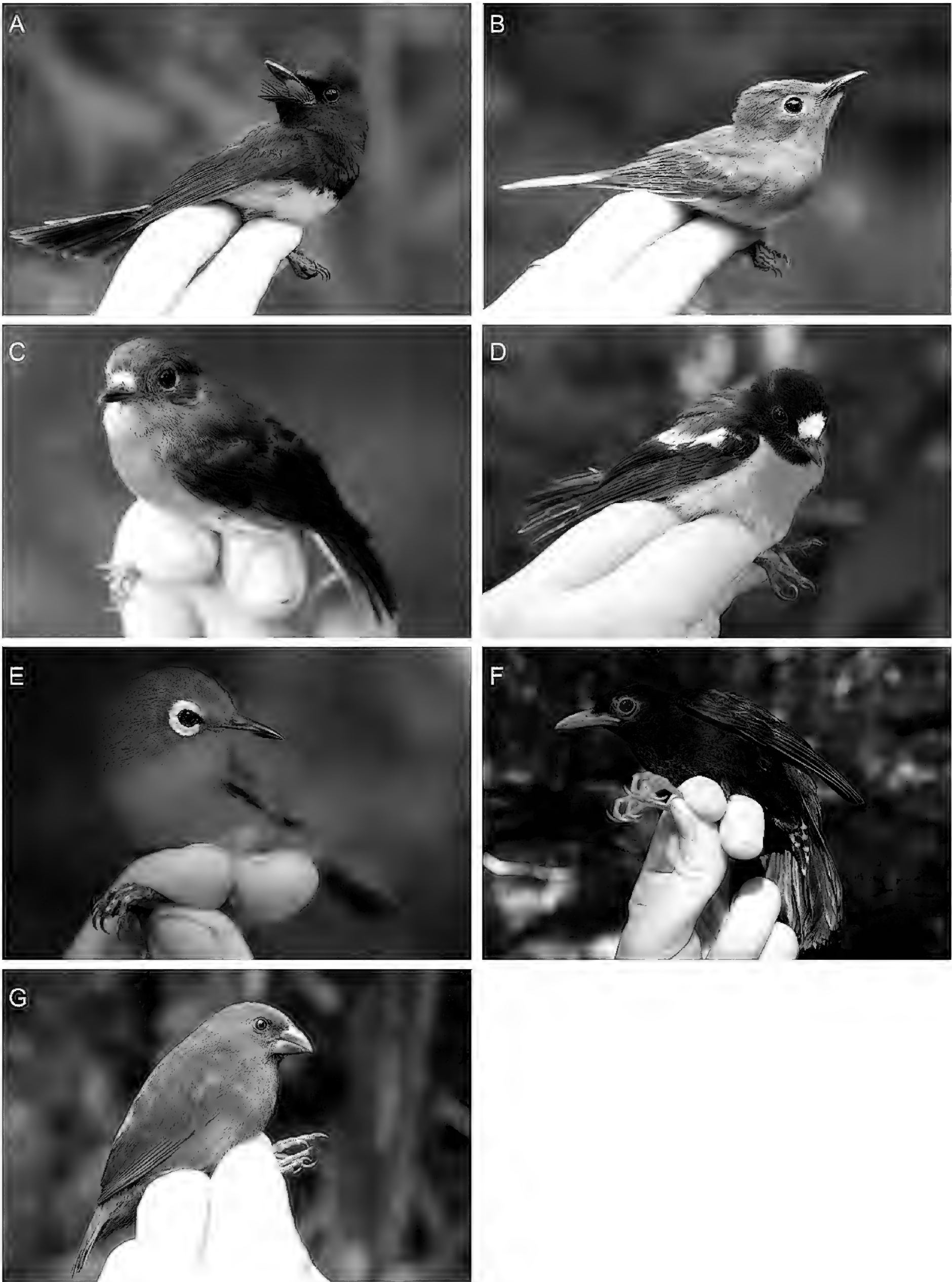


Figure 4. Photos of birds mistnetted during our survey of Vanuatu: **A.** Melanesian Flycatcher *Myiagra caledonica* (male). **B.** Melanesian Flycatcher *Myiagra caledonica* (female). **C.** Pacific Robin *Petroica multicolor feminina*. **D.** Pacific Robin *Petroica multicolor ambrynsensis*. **E.** Yellow-fronted White-eye *Zosterops flavifrons*. **F.** Island Thrush *Turdus poliocephalus efatensis*. **G** Royal Parrotfinch *Erythrura regia*.

Sturnidae

Acridotheres tristis (Linnaeus, 1766), Common Myna

Estrildidae

Estrilda astrild (Linnaeus, 1758), Common Waxbill

Erythrura trichroa (Kittlitz, 1833), Blue-faced Parrotfinch

Erythrura regia (Sclater, 1881), Royal Parrotfinch: Figure 4G

Discussion

In this paper, we summarize results of an ornithological survey on 4 islands in Vanuatu. Our total of 35 native species recorded at our survey site on Malakula is the highest single-site total we are aware of in Vanuatu. Kratter et al. (2006) recorded 30 native species at 2 different sites on Santo with a combined list of 33 species, which was the highest single-site total in Vanuatu until our survey. Steadman (2006a) suggests that as many as 50 landbird species occur on Santo, but this number includes grebes, herons, and ducks, which we did not record. On Malakula, as many as 31 species of resident landbirds are known from bones (Steadman 2006a), including 3 species that no longer occur on the island: Spotless Crane, *Zapornia (Porzana) tabuensis*, and 2 extinct species—a flightless *Porzana* rail and an *Eclectus* parrot (Steadman 2006b). Our survey of Malakula produced a large single-site species total, but we do not suggest this to mean Malakula is more diverse than Santo. Indeed, Santo is 52% larger than Malakula and it has 2 montane endemic species (Mountain Starling, *Aplonis santovestris* and Guadalcanal “Santo” Thicketbird, *Megalurulus whitneyi*). Diamond and Marshall (1977) tabulated New Hebridean species diversity per island, and they found that the higher diversity of birds on Santo upholds the prediction of the equilibrium theory of island biogeography (MacArthur and Wilson 1967). Clearly, Santo and Malakula are Vanuatu’s most species-rich islands because of their size and elevational relief on Santo. Site-specific diversity can be affected by survey effort and habitat heterogeneity; thus, whereas our results set a new bar for species richness at a single site in Vanuatu, our total likely will be surpassed with increased survey effort on Santo.

Summary of breeding evidence

Our surveys in November and December coincided with the previously reported breeding season (Bregulla 1992) of birds in Vanuatu: September to February. This corresponds with the end of the dry season and the onset of the wet season (Bregulla 1992). We observed evidence of breeding in a total of 25 species (Table 3), 15 species on both Éfaté and Malakula, but only 7 species each on Gaua and Vanua Lava. In general, the amount of breeding activity was highest on Éfaté and Malakula and became progressively less evident as we moved north to Gaua,

and Vanua Lava. This observation is consistent with the Austral Spring and suggests that breeding occurs later in higher latitudes (i.e., farther south) than lower latitudes in Vanuatu. Kratter et al. (2006) observed increased evidence of breeding on Santo during surveys in October and November, but markedly less evidence of breeding there during a June survey, further supporting a seasonal trend towards increased breeding late in the year. This coincides with a relatively dry period before the onset of the tropical cyclone season from January to April.

Éfaté Island. The dawn chorus at our camp on Éfaté began at 04:10–04:15 h. The first species to begin vocalizing were Dark-brown Honeyeater (*Lichmera incana*), Vanuatu Whistler (*Pachycephala chlorura*), and Yellow-fronted White-eye (*Zosterops flavifrons*), and by 04:30 h, the chorus was cacophonous. Other vocal species included Metallic Pigeon (*Columba vitiensis*), Pacific Emerald Dove (*Chalcophaps longirostris*), Red-bellied Fruit-Dove (*Ptilinopus greyi*), Pacific Kingfisher (*Todiramphus sacer*), Long-tailed Triller (*Lalage leucopyga*), Streaked Fantail (*Rhipidura verreauxi*), Buff-bellied Monarch (*Neolalage banksiana*), Melanesian Flycatcher (*Myiagra caledonica*), and Pacific Robin (*Petroica multicolor*). Other breeding evidence was noted, including a single *T. sacer* seen departing a nest cavity in a rotting log and an adult female *P. chlorura* feeding young. *Pachycephala chlorura* was heard frequently singing at night. Overall, most males had enlarged testes and seminal vesicles and females had enlarged ovaries and yolks with convoluted oviducts. Only some females had brood patches (Table 3) and few individuals had bursae of Fabricius. These details of breeding condition, combined with high vocal activity, suggest birds were at peak courtship with egg laying about to commence.

Malakula Island. The dawn chorus at our camp on Malakula began at 03:30 h when *Rhipidura verreauxi* sang loudly followed by *Pachycephala chlorura* at 04:15–04:20 h. *Rhipidura verreauxi* began singing up to 1 hour prior to first light and we often heard it singing single phrases throughout the night. Other vocal species included Vanuatu Scrubfowl (*Megapodius layardi*), which we heard singing at night at least once, Mackinlay’s Cuckoo-Dove (*Macropygia mackinlayi*), *Ptilinopus greyi*, Pacific Imperial-Pigeon (*Ducula pacifica*), Shining Bronze-Cuckoo (*Chrysococcyx lucidus*), and Vanuatu Kingfisher (*Todiramphus farquhari*), *T. sacer*, and *Lalage leucopyga*. Many passerines that were highly vocal on Éfaté just a week prior, were not singing on Malakula during our survey, including *Petroica multicolor*, *Myiagra caledonica*, and *Zosterops flavifrons*. Overall, breeding activity appeared to be more advanced temporally than our survey on Éfaté. For example, we noted brood patches in females of the following species: *M. caledonica*, *Pachycephala chlorura*, *Petroica multicolor*, and *R. verreauxi*, but we found bursae of Fabricius only in single individuals of Glossy Swiftlet (*Collocalia esculenta*), *Todiramphus sacer*, Cardinal Myzomela (*Myzomela cardinalis*), and Island Thrush (*Turdus polio-*

cephalus), suggesting that widespread fledging had not commenced. Furthermore, we did not observe any fledglings or juvenile-plumaged birds.

Gaua Island. The dawn chorus was non-existent at our camp on Gaua. Indeed, compared to our surveys on Éfaté and Malakula, the forests of Gaua were eerily quiet with respect to bird song; only *Myzomela cardinalis* was active vocally. Lack of bird song suggests that the breeding season had progressed at least past male territorial defense and courtship, and observation of a family group of Southern Shrikebill (*Clytorhynchus pachycephaloides*) suggests at least some species had already fledged young. We observed enlarged gonads in 4 species: Fan-tailed Gerygone (*Gerygone flavolateralis*), *C. pachycephaloides*, *Myiagra caledonica*, and *Petroica multicolor* and bursae of Fabricius in *Myzomela cardinalis*, *Rhipidura verreauxi*, *C. pachycephaloides*, and *Turdus poliocephalus*. Numerous species were in molt, including Palm Lorikeet (*Charmosyna palmarum*), *Clytorhynchus pachycephaloides*, *Gerygone flavolateralis*, *Myzomela cardinalis*, *Pachycephala chlorura*, *Rhipidura verreauxi*, and *Turdus poliocephalus*, which often commences post-breeding.

Vanua Lava Island. Vocal evidence for breeding on Vanua Lava was minimal. Like Gaua, the dawn chorus was minimal with only Vanuatu Honeyeater *Gliciphila notabilis* engaging in dawn singing. Otherwise, *Macropygia mackinlayi* was vocally active throughout the day, but species like *Pachycephala chlorura*, *Rhipidura verreauxi*, and *Zosterops flavifrons* were virtually silent. We noted enlarged gonads in several species of pigeons, including *M. mackinlayi*, *Chalcophaps longirostris*, and *Ptilinopus greyi*, plus *Petroica multicolor*, *Zosterops flavifrons*, and *Turdus poliocephalus*. Brood patches were evident on *G. notabilis* and *Z. flavifrons*, and one *Z. flavifrons* was yolking, suggesting at least those species were incubating and/or laying clutches.

Non-native birds and mammals

We observed 6 species of non-native birds during our surveys: 3 at our survey sites, plus 3 additional species in transit between sites. In general, most non-native bird species in Vanuatu are confined to islands with the greatest Western influence (Bregulla 1992). Indeed, Éfaté and Santo have the most non-native species with lesser numbers on Tanna (Medway and Marshall 1975). However, overall number and diversity of non-native species is far less than other archipelagos in the Southwest Pacific (e.g., Fiji). Red Junglefowl was fairly common at our Éfaté and Malakula sites, but absent from our sites on Gaua and Vanua Lava. This was the only non-native species present in native forest habitats at any of our 4 survey sites. We observed small flocks ($N = 1-3$ birds) of Rock Pigeon *Columba livia* in Port Vila. In Vanuatu, *C. livia* is known only from Port Vila, Éfaté and Luganville, Santo (Dutson 2011, eBird 2017). We observed Common Myna on Éfaté, where it was most common in Port Vila. Our camp was within earshot of a small flock of Common Myna,

but they never approached the forest, preferring cattle pastures on nearby Tukutuku Ranch. We also observed Common Myna on Santo (while in transit) where it was uncommon at Luganville Santo-Pekoa International Airport. In addition to Éfaté and Santo, Common Myna occurs on Malo, Paama, Epi, and Tanna (Dutson 2011), but the only records in eBird are from Éfaté, Santo, and Tanna (eBird 2017) highlighting the incomplete nature of eBird records in Melanesia. We observed House Sparrow (*Passer domesticus*) only in Port Vila, which is the only known location in Vanuatu (Dutson 2011, eBird 2017). We observed one flock of Common Waxbill ($N = 14$ birds) on Tukutuku Ranch, Éfaté. There was a small population on Santo, which is thought to be extirpated (Dutson 2011); only 2 records (from 1985 and 2002) are in eBird (eBird 2017). This species is not known to occur elsewhere in Vanuatu. Finally, we observed small groups ($N = 1-7$ birds) of Chestnut Munia (*Lonchura atricapilla*) on Malakula (Norsup Airport and Lingarak Village), plus 1 flock of 50 birds at Luganville Santo-Pekoa International Airport, Santo. Chestnut Munia is known to occur in Vanuatu only on Santo, Aore, Malo, and Malakula (Dutson 2011), but the only eBird records are from Santo and Malakula (eBird 2017).

In addition to non-native birds, we observed several non-native mammals that pose threats to bird populations in Vanuatu, either directly by predation (cats, rats), indirectly via degradation of understorey vegetation (pigs), or wholesale deforestation for cattle grazing (Steadman 2006a). Medway and Marshall (1975) provide a historical overview of non-native mammalian introductions in Vanuatu. We found pigs and dogs were prevalent in villages, and we observed dogs in interior forest on Malakula where they used forest paths to access interior sections of the island. Rats were noted in villages on all 4 surveyed islands. Kratter et al. (2006) documented 2 species of rats during their survey: Black Rat (*Rattus rattus*) and Polynesian Rat (*Rattus exulans*), but we did not set traps to document species diversity during our survey. Finally, we observed cattle grazing on deforested land adjacent to our survey site on Éfaté, and while in transit on Santo, but nowhere else.

Species not recorded at our sites

Non-passerines. We failed to detect several species at our field sites that are known to exist on those islands. Vanuatu Scrubfowl was apparently common on Éfaté when the WSSE visited in June and July 1926, as evidenced by a series of 26 specimens at the American Museum of Natural History. It is threatened on Éfaté by human encroachment (Bregulla 1992). Dutson (2011) lists Vanuatu Scrubfowl as present on Éfaté, but the lack of recent records (eBird 2017) suggests it may now be extirpated. The IUCN lists it as Vulnerable with a decreasing population trend owing to unsustainable egg-collecting and loss of lowland forest (IUCN 2016). Indeed, its current stronghold occurs on islands north of Éfaté, such as Ambrym, Malakula, and Santo. We failed to detect Tanna Fruit-Dove (*Ptilinopus*

tannensis) on Vanua Lava, despite the WSSE having collected 3 specimens from 9–12 November 1926. It is likely that we failed to detect *P. tannensis* on Vanua Lava due to our short survey, not due to its rarity. The IUCN status is Least Concern (IUCN 2016). Fan-tailed Cuckoo (*Cacomantis flabelliformis*) was also recorded on Éfaté, Malakula, and Gaua by the WSSE; it too was apparently common, with series of specimens collected from the aforementioned 3 islands. We never detected it during our surveys, despite MJA being familiar with its vocalizations from Fiji. Its IUCN status is Least Concern (IUCN 2016); however, this status pertains to a widespread, polytypic taxa that occurs from Australia and New Guinea east to Fiji. It would be informative if unique status was assigned to each of 6 major populations: Australia, New Guinea, Solomon Islands, Vanuatu, New Caledonia, and Fiji. Thus, archipelago-specific population declines (e.g., on Vanuatu) could be better addressed by the conservation community. These issues could be better dealt with if evolutionary significant units were highlighted by a detailed phylogeographic study of this species complex. We failed to detect Barn Owl (*Tyto alba*) on Vanua Lava, but this is easily attributed to our short stay there ($N = 3$ days) in primary forest. Palm Lorikeet was fairly common at our site on Gaua, but we did not detect it hiking to Lake Letes, nor on other islands. This lorikeet is thought to be nomadic with historic records from Southern Vanuatu where it no longer occurs (Bregulla 1992). This pattern of nomadism is known from other Vanuatu birds and has been hypothesized to be an adaptation to frequent disturbance from cyclones or population booms in response to resource availability (Diamond 1975, Diamond and Marshall 1976). The IUCN status of *Charmosyna palmarum* is Vulnerable with a declining population trend (IUCN 2016).

Passerines. We failed to observe Rusty-winged Starling (*Aplonis zelandica*) from the Banks Islands, despite that the WSSE collected specimens from Gaua and Bligh Islands. They are known as far south as Malakula (Dutson 2011; WSSE, $N = 1$ specimen), but we failed to record them; their IUCN status is Near Threatened with a declining population trend (IUCN 2016). Melanesian Flycatcher was fairly common on 3 of 4 surveyed islands, but curiously, we did not find it on Gaua. The WSSE collected only 3 specimens from Gaua on 11 September and 23 November 1926 suggesting it is uncommon on that island. Its IUCN status is Least Concern (IUCN 2016). Finally, Gray Fantail (*Rhipidura albiscapa*) is a forest edge species that was difficult to detect at most of our sites because we focused our surveys on primary forest. We failed to detect it anywhere on Malakula and, interestingly, the WSSE did not collect it there. Its IUCN status is Least Concern (IUCN 2016), and we readily found it in Port Vila, as well as coastal villages on Gaua and Vanua Lava.

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Authors' Contributions

MJA, LF, WMM, and BTS collected the data; MJA wrote the text with input from all co-authors.

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Table 3. Breeding evidence from specimens included females that were yolking, had convoluted oviducts, or a brood patch and males with enlarged testes or enlarged seminal vesicles. Behavioral evidence included male territorial vocalizations, adults feeding young, and active nests. The number of sex-specific specimens examined appears after the evidence (e.g., *N* = 4 means we examined 4 individuals of a particular sex at that site).

Species	Éfaté		Malakula		Gaua		Vanua Lava	
	Female	Male	Female	Male	Female	Male	Female	Male
<i>Megapodius layardi</i>	—	—	—	territorial vocalizations	—	—	—	—
<i>Gallirallus philippensis</i>	—	enlarged testes (<i>N</i> = 2)	—	—	—	—	—	—
<i>Columba vitiensis</i>	—	—	—	territorial vocalizations	—	—	—	—
<i>Macropygia mackinlayi</i>	—	enlarged testes (<i>N</i> = 3), territorial vocalizations	convoluted oviduct (<i>N</i> = 1)	—	—	—	yolking, convoluted oviduct (<i>N</i> = 1)	territorial vocalizations
<i>Chalcophaps longirostris</i>	yolking, convoluted oviduct (<i>N</i> = 4)	enlarged testes (<i>N</i> = 4), territorial vocalizations	yolking, convoluted oviduct (<i>N</i> = 2)	territorial vocalizations	—	—	yolking, convoluted oviduct (<i>N</i> = 1)	—
<i>Ptilinopus greyi</i>	yolking, convoluted oviduct (<i>N</i> = 4)	enlarged testes (<i>N</i> = 4), territorial vocalizations	yolking, convoluted oviduct (<i>N</i> = 2)	territorial vocalizations	—	—	convoluted oviduct (<i>N</i> = 1)	enlarged testes (<i>N</i> = 4), territorial vocalizations
<i>Ducula pacifica</i>	—	—	—	territorial vocalizations	—	—	—	—
<i>Chrysococcyx lucidus</i>	—	—	—	territorial vocalizations	—	—	—	—
<i>Aerodramus vanikorensis</i>	convoluted oviduct (<i>N</i> = 2)	—	—	—	—	—	—	—
<i>Todiramphus farquhari</i>	—	—	—	territorial vocalizations	—	—	—	—
<i>Todiramphus sacer</i>	—	active nest, territorial vocalizations	—	territorial vocalizations	—	—	—	—
<i>Myzomela cardinalis</i>	—	—	—	—	—	territorial vocalizations	—	—
<i>Gliciphila notabilis</i>	—	—	—	—	—	—	convoluted oviduct, brood patch (<i>N</i> = 2)	territorial vocalizations
<i>Lichmera incana</i>	—	territorial vocalizations	—	—	—	—	—	—
<i>Gerygone flavolateralis</i>	—	—	—	—	yolking, convoluted oviduct (<i>N</i> = 3)	—	—	—
<i>Lalage leucopyga</i>	—	territorial vocalizations	—	territorial vocalizations	—	—	—	—
<i>Pachycephala chlorura</i>	adult feeding young	enlarged testes (<i>N</i> = 6), territorial vocalizations	convoluted oviduct (<i>N</i> = 3)	territorial vocalizations	—	—	—	—
<i>Rhipidura verreauxi</i>	—	enlarged testes and seminal vesicles (<i>N</i> = 5), territorial vocalizations	convoluted oviduct (<i>N</i> = 3)	territorial vocalizations	convoluted oviduct, brood patch (<i>N</i> = 4)	—	—	—
<i>Neolalage banksiana</i>	convoluted oviduct (<i>N</i> = 4)	—	—	—	—	—	—	—
<i>Myiagra caledonica</i>	—	territorial vocalizations	—	—	—	—	—	—
<i>Petroica multicolor</i>	—	enlarged testes and seminal vesicles (<i>N</i> = 3), territorial vocalizations	—	—	yolking (<i>N</i> = 1)	—	—	enlarged testes and seminal vesicles (<i>N</i> = 1)
<i>Zosterops lateralis</i>	convoluted oviduct (<i>N</i> = 1)	—	—	—	—	—	—	—
<i>Zosterops flavifrons</i>	yolking, convoluted oviduct (<i>N</i> = 4)	enlarged testes (<i>N</i> = 4), territorial vocalizations	yolking, convoluted oviduct (<i>N</i> = 5)	—	convoluted oviduct, brood patch (<i>N</i> = 5)	—	yolking, convoluted oviduct, brood patch (<i>N</i> = 5)	enlarged testes and seminal vesicles (<i>N</i> = 4)
<i>Turdus poliocephalus</i>	—	enlarged testes and seminal vesicles (<i>N</i> = 8)	—	—	brood patch (<i>N</i> = 1)	—	—	enlarged testes and seminal vesicles (<i>N</i> = 1)
<i>Erythrura regia</i>	—	—	—	—	brood patch (<i>N</i> = 1)	—	—	—

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Appendix

Table A1. List of specimen vouchers deposited at the American Museum of Natural History, New York, NY, USA and Vanuatu Cultural Center, Port Vila, Vanuatu (marked with * in DOT column). Up to 4 catalog numbers are given for vouchers: DOT, Department of Ornithology Tissue; FLUID, formalin-fixed; SKEL, whole or partial skeleton; SKIN, round skin.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21332			841300	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	102
21335			841301	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	97.1
21441			841302	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	102.9
21451	14637			Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		107.2
21466		TBD	841303	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	111.1
21566			841304	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	101.9
21343			841305	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	84.5
21452			841306	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	76.7
21467		TBD	841307	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	92.7
21556*				Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	83.1
21356			841308	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Male	5.2
21563			841309	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Male	5
21338			841310	Apodidae	<i>Aerodramus</i>	<i>vanikorensis</i>	<i>vanikorensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	12.2
21350			841311	Apodidae	<i>Aerodramus</i>	<i>vanikorensis</i>	<i>vanikorensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	11.4
21333			841312	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	55.7

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21347			841313	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	56.8
21354			841314	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	49.3
21440			841315	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	54.9
21453			841316	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	48
21551			841317	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	50.6
21560			841318	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	56.6
21567*				Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	55.4
21342			841319	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	21.1
21447			841320	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	11.8
21448			841321	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	13.7
21464	14643			Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		12.9
21557			841322	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	12.9
21568*				Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	11.5
21336			841323	Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	15.2
21457			841324	Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	
21465			841325	Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Male	
21353*				Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Female	14.8
21334			841326	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	17.1
21351			841327	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	21.7
21442			841328	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	25.2
21454			841329	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	21.9
21460			841330	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	25.8
21461		TBD	841331	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	25.4
21550			841332	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	26
21558			841333	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	23.4
21562			841334	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	24.7
21564	14649			Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	25.4
21552*				Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		25.5
21554*				Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	27.2
21337			841335	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	24.4
21341			841336	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	13.5
21345			841337	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	13.6
21348			841338	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	14.5
21439			841339	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	15.1
21458	14651			Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	12.4
21559			841340	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		13.8
21331*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	12.9
21548*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	13.9
21340			841341	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	14.4
21344			841342	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	18.2
								Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	16.5

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21355			841343	Monarchidae	Neolalage	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	15.2
21446			841344	Monarchidae	Neolalage	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	17.3
21449			841345	Monarchidae	Neolalage	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	17
21459			841346	Monarchidae	Neolalage	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	19.6
21549*				Monarchidae	Neolalage	<i>banksiana</i>		Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	16.6
21555*				Monarchidae	Myiagra	<i>caledonica</i>	<i>marinae</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	11.9
21339			841347	Petroicidae	Petroica	<i>multicolor</i>	<i>feminina</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	10.5
21468			841348	Petroicidae	Petroica	<i>multicolor</i>	<i>feminina</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	10.7
21561*				Petroicidae	Petroica	<i>multicolor</i>	<i>feminina</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	11
21469			841355	Zosteropidae	Zosterops	<i>lateralis</i>	<i>vatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Male	15
21346*			841354	Zosteropidae	Zosterops	<i>lateralis</i>	<i>vatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	17.3
21330			841350	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	15.2
21352			841349	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	12.3
21443	14646			Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		10.1
21444	14647			Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		10.7
21455			841351	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	12
21456		TBD		Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Overgrown pasture	Female	14.9
21553			841352	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	12.3
21565			841353	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Female	10.4
21438*				Zosteropidae	Zosterops	<i>flavifrons</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	11.8
21349			841356	Turdidae	Turdus	<i>poliocephalus</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	51.7
21450			841357	Turdidae	Turdus	<i>poliocephalus</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	50.8
21462			841358	Turdidae	Turdus	<i>poliocephalus</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	44.9
21463	14658			Turdidae	Turdus	<i>poliocephalus</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest		43.3
21445*				Turdidae	Turdus	<i>poliocephalus</i>	<i>efatensis</i>	Shéfa	Éfaté	-17.6029	168.2827	Mature secondary forest	Male	44.8
21361			841418	Rallidae	Hypotaenidia	<i>philippensis</i>	<i>sethsmithi</i>	Malampa	Malakula	-16.2134	167.4356	Forest along stream	Male	213.4
21497		TBD	841419	Rallidae	Hypotaenidia	<i>philippensis</i>	<i>sethsmithi</i>	Malampa	Malakula	-16.2134	167.4356	Riparian streamside vegetation	Male	224.4
21570			841400	Columbidae	Macropygia	<i>mackinlayi</i>	<i>mackinlayi</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	100.3
21581		TBD		Columbidae	Macropygia	<i>mackinlayi</i>	<i>mackinlayi</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	91.7
21585	14635			Columbidae	Macropygia	<i>mackinlayi</i>	<i>mackinlayi</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens		75.2
21368*			841399	Columbidae	Macropygia	<i>mackinlayi</i>	<i>mackinlayi</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	91
21588*				Columbidae	Macropygia	<i>mackinlayi</i>	<i>mackinlayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Male	75
21474			841401	Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	110.7
21478	14638			Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens		100.4
21482	14639			Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens		95.3
21492		TBD	841402	Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	98.8
21494			841403	Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	92.4
21505		TBD		Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens Garden	Male	108.9
21572			841404	Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	
21385*				Columbidae	Chalcophaps	<i>indica</i>	<i>sandwichensis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	112.8

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21365			841405	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	94.2
21372			841406	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	83
21380			841407	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	73.8
21481			841408	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	80.4
21485			841409	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	89.9
21589			841410	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	76.3
21510	TBD			Tytonidae	<i>Tyto</i>	<i>delicatula</i>		Malampa	Malakula	-16.18	167.4697		Male	
21388			841411	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Female	4.4
21389			841412	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	4.8
21498			841413	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian stream	Male	5.3
21500			841414	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest with stream	Male	4.9
21507		TBD		Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356		Male	5.2
21595	14641			Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream		5
21598			841415	Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Female	4.1
21395*				Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	5.1
21593*				Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Female	4.6
21596*				Apodidae	<i>Collocalia</i>	<i>esculenta</i>	<i>uropygialis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	4.8
21499			841416	Apodidae	<i>Aerodramus</i>	<i>spodiopygius</i>	<i>epiensis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian stream	Male	5.8
21508			841417	Apodidae	<i>Aerodramus</i>	<i>spodiopygius</i>	<i>epiensis</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest with stream	Female	6.9
21376			841420	Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	37.1
21480			841421	Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	39.9
21509		TBD	841518	Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.18	167.4697		Male	38.2
21584	14642			Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens		37.9
21587			841422	Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	39.5
21586*				Alcedinidae	<i>Todiramphus</i>	<i>farquhari</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Male	36.2
21378			841423	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	55.9
21472			841424	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	57.3
21486			841425	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	54.5
21504			841426	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	54.5
21577*				Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>juliae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	56
21386		TBD	841427	Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden	Male	16.9
21387			841428	Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden	Male	116.6
21391			841429	Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden	[Female]	108.6
21496	14640			Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden		116.7
21506		TBD		Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden	Male	115.4
21591		TBD	841431	Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Gardens	Female	97.8
21495*		TBD	841430	Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Garden	Female	92.9
21592*				Psittaculidae	<i>Trichoglossus</i>	<i>haematodus</i>	<i>massena</i>	Malampa	Malakula	-16.2134	167.4356	Gardens	Male	110.2
21364			841433	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	12.5
21373			841434	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	12.1

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21379			841435	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	11.5
21583	14644			Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens		9.4
21599			841436	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	7.8
21597*				Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Malampa	Malakula	-16.2134	167.4356	Gardens	Male	11.1
21503			841432	Meliphagidae	<i>Glycifohia</i>	<i>notabilis</i>	<i>superciliaris</i>	Malampa	Malakula	-16.2134	167.4356	Garden	Male	26.6
21493			841437	Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	15.3
21491*				Meliphagidae	<i>Lichmera</i>	<i>incana</i>	<i>griseoviridis</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	16
21357			841438	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	23.1
21358			841439	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	23.3
21360			841440	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	22
21366			841441	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	22.1
21375			841442	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	22.1
21377			841443	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	23.8
21471			841444	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	22.6
21489			841445	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	23.8
21578	14650			Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens		24.5
21362*				Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	23.5
21363			841446	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	91
21374			841447	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	14.2
21390			841448	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	14.9
21470			841449	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	11.7
21484	14652			Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens		11.2
21487			841450	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	13.4
21575			841451	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	11.9
21594	14655			Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream		15.2
21359*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	13.7
21476*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	14.1
21369			841453	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	17
21393			841454	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Female	17.5
21501			841455	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Female	15.6
21502	14656			Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens		14.9
21580*				Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	
21371			841456	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseus</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	26.1
21574			841457	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseus</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	29.2
21488			841452	Monarchidae	<i>Myiagra</i>	<i>caledonica</i>	<i>marinae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Female	14.4
21475			841458	Petroicidae	<i>Petroica</i>	<i>multicolor</i>	<i>ambrynsensis</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	9.2
21382			841459	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	10.2
21383			841460	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Female	10.5
21384			841461	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Male	11.3
21479			841462	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Male	11.4

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Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21483			841463	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest with gardens	Female	9.1
21579	14648			Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens		10.6
21370*				Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest bordered by gardens	Female	10.3
21394*				Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and garden	Male	10.7
21576*				Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	10.2
21590*			841464	Zosteropidae	Zosterops	<i>flavifrons</i>	<i>macgillivrayi</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens	Female	10.8
21381			841466	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	48.5
21392			841467	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Riparian forest along stream	Male	45.4
21473			841468	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Female	47.7
21490			841469	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	50.5
21569			841470	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	46.8
21571			841471	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	47.6
21573			841472	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	52.1
21582	14659			Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Secondary forest and gardens		51.3
21367*			841465	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	42.2
21477*				Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>malekulae</i>	Malampa	Malakula	-16.2134	167.4356	Primary forest bordered by gardens	Male	48.9
21615*				Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	104
21409			841359	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	74.8
21412			841360	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	55
21522		TBD	841361	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	51.1
21519*				Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	46.6
21408		TBD	841362	Psittaculidae	<i>Charmosyna</i>	<i>palmarum</i>		Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	37.5
21416			841363	Psittaculidae	<i>Charmosyna</i>	<i>palmarum</i>		Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	40.6
21611		TBD	841364	Psittaculidae	<i>Charmosyna</i>	<i>palmarum</i>		Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	35.5
21521*		TBD	841517	Psittaculidae	<i>Charmosyna</i>	<i>palmarum</i>		Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	36.2
21411			841365	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	13.2
21523			841366	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	14.8
21525		TBD		Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	15.1
21606			841367	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	12.9
21609			841368	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	15.7
21613	14645			Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	[Male]	13.6
21614			841369	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	13.3
21616		TBD	841370	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	12.7
21410*				Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	12.1
21400			841371	Acanthizidae	<i>Gerygone</i>	<i>flavolateralis</i>	<i>correiae</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	7.5
21402			841372	Acanthizidae	<i>Gerygone</i>	<i>flavolateralis</i>	<i>correiae</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	5.6
21524			841373	Acanthizidae	<i>Gerygone</i>	<i>flavolateralis</i>	<i>correiae</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	7.5
21612*		TBD		Acanthizidae	<i>Gerygone</i>	<i>flavolateralis</i>	<i>correiae</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	6.2
21404			841374	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	28.9

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21517			841375	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	28.1
21604			841376	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	25.9
21605			841377	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	26.6
21607			841378	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	28.5
21397			841379	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	14.5
21398			841380	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	13.7
21399			841381	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	13.6
21511			841382	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	13.8
21514			841383	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	12.5
21515	14653			Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest		14.6
21516			841384	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	10.5
21602			841385	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	14.1
21396*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	12
21601*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	
21401			841386	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	27.9
21403			841387	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	26.8
21513			841388	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	28.4
21608			841389	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	30.8
21413*				Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	27.8
21610*				Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseszens</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	31.7
21405			841390	Petroicidae	<i>Petroica</i>	<i>multicolor</i>	<i>ambrynnensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	9.6
21603			841391	Petroicidae	<i>Petroica</i>	<i>multicolor</i>	<i>ambrynnensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	10.9
21406			841393	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>gauensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	13.1
21414			841394	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>gauensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	12.3
21415			841395	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>gauensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	11.5
21520			841396	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>gauensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	12.7
21600*				Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>gauensis</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	14.7
21512			841397	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>whitneyi</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	48.6
21518			841398	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>whitneyi</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Male	46.1
21407			841392	Estrildidae	<i>Erythrura</i>	<i>cyaneovirens</i>	<i>regia</i>	Torba	Gaua	-14.2747	167.5488	Premontane primary forest	Female	18.3
21633	14634			Rallidae	<i>Hypotaenidia</i>	<i>philippensis</i>	<i>sethsmithi</i>	Torba	Vanua Lava	-13.8983	167.5338	Village		144.2
21428			841473	Columbidae	<i>Macropygia</i>	<i>mackinlayi</i>	<i>mackinlayi</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	77.4
21537			841474	Columbidae	<i>Macropygia</i>	<i>mackinlayi</i>	<i>mackinlayi</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	80.1
21624			841475	Columbidae	<i>Macropygia</i>	<i>mackinlayi</i>	<i>mackinlayi</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	
21627		TBD	841476	Columbidae	<i>Macropygia</i>	<i>mackinlayi</i>	<i>mackinlayi</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	73.1
21629	14636			Columbidae	<i>Macropygia</i>	<i>mackinlayi</i>	<i>mackinlayi</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest		80.1
21534			841477	Columbidae	<i>Chalcophaps</i>	<i>indica</i>	<i>sandwichensis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	107.6
21426			841478	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	71.9
21430			841479	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	78.2

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21533			841480	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	78.5
21622			841481	Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	89.5
21623*				Columbidae	<i>Ptilinopus</i>	<i>greyi</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	69.8
21429			841482	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	52.8
21529		TBD	841483	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	49.3
21626			841484	Alcedinidae	<i>Todiramphus</i>	<i>chloris</i>	<i>santoensis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	50.4
21437			841488	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.3
21631			841489	Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	13.7
21543*				Meliphagidae	<i>Myzomela</i>	<i>cardinalis</i>	<i>tenuis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	10.1
21421		TBD	841485	Meliphagidae	<i>Glycifohia</i>	<i>notabilis</i>	<i>notabilis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	34.2
21632			841487	Meliphagidae	<i>Glycifohia</i>	<i>notabilis</i>	<i>notabilis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	25.9
21427*			841486	Meliphagidae	<i>Glycifohia</i>	<i>notabilis</i>	<i>notabilis</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	23
21418			841490	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	25.6
21424			841491	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	25.8
21619			841492	Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	28
21535*				Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	24.9
21620*		TBD		Pachycephalidae	<i>Pachycephala</i>	<i>chlorura</i>	<i>intacta</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	26.1
21419			841493	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	14.8
21420			841494	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	10.9
21422			841495	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	14.1
21425			841496	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.2
21436			841497	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	14.1
21540	14654			Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.1
21541			841498	Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	10.5
21545		TBD		Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	13.1
21417*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	13.6
21617*				Rhipiduridae	<i>Rhipidura</i>	<i>verreauxi</i>	<i>spilodera</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.8
21432			841502	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	18.5
21434			841503	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	20.9
21530		TBD	841504	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	15.8
21536			841505	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	18.6
21628			841506	Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	17.6
21433*				Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	15.8
21531*				Monarchidae	<i>Neolalage</i>	<i>banksiana</i>		Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	15.8
21546	14657			Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	29.1
21625			841507	Monarchidae	<i>Clytorhynchus</i>	<i>pachycephaloides</i>	<i>griseus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	34
21528			841499	Monarchidae	<i>Myiagra</i>	<i>caledonica</i>	<i>marinae</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	14.5
21542			841500	Monarchidae	<i>Myiagra</i>	<i>caledonica</i>	<i>marinae</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	13.6
21547			841501	Monarchidae	<i>Myiagra</i>	<i>caledonica</i>	<i>marinae</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	13.7

Continued

Table A1. Continued.

DOT	Fluid	Skel	Skin	Family	Genus	Species	Subspecies	Province	Island	Latitude	Longitude	Habitat Description	Sex	Weight (g)
21630			841508	Petroicidae	<i>Petroica</i>	<i>multicolor</i>	<i>soror</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	10.7
21435*				Petroicidae	<i>Petroica</i>	<i>multicolor</i>	<i>soror</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.2
21423			841509	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.9
21527			841510	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.7
21532			841511	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	12.8
21539			841512	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	12.4
21544			841513	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	11.9
21618			841514	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Female	12.2
21621			841515	Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	12.2
21431*				Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	12.1
21526*				Zosteropidae	<i>Zosterops</i>	<i>flavifrons</i>	<i>perplexus</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	13
21538			841516	Turdidae	<i>Turdus</i>	<i>poliocephalus</i>	<i>placens</i>	Torba	Vanua Lava	-13.8876	167.5287	Premontane primary forest	Male	42.4

Table A2. List of species audio recorded with corresponding Macaulay Library catalog numbers. All recordings are available online (<http://www.macaulaylibrary.org>).

English name	Species	Macaulay Library (ML) catalog
Vanuatu Scrubfowl	<i>Megapodius layardi</i>	515728, 515736
Metallic Pigeon	<i>Columba vitiensis</i>	515077
Mackinlay’s Cuckoo-Dove	<i>Macropygia mackinlayi</i>	515735, 515786
Pacific Emerald Dove	<i>Chalcophaps longirostris sandwichensis</i>	515707
Tanna Fruit-Dove	<i>Ptilinopus tannensis</i>	515705
Red-bellied Fruit-Dove	<i>Ptilinopus greyi</i>	515040
Pacific Imperial-Pigeon	<i>Ducula pacifica</i>	515713
Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>	515738
Vanuatu Kingfisher	<i>Todiramphus farquhari</i>	515715, 515716, 515726, 515731
Pacific Kingfisher	<i>Todiramphus sacer</i> <i>T. s. juliae</i>	515041, 515045, 515066, 515068, 515725, 515727
Palm Lorikeet	<i>Charmosyna palmarum</i>	515768, 515770, 515771, 515774, 515779, 515781, 515782
Rainbow Lorikeet	<i>Trichoglossus haematodus massena</i>	515071, 515699, 515729, 515775, 515778, 515783
Cardinal Myzomela	<i>Myzomela cardinalis</i>	515769, 515773, 515777, 515780, 515788, 515790, 515791
Vanuatu Honeyeater	<i>Gliciphila notabilis</i> <i>G. n. superciliaris</i> <i>G. n. notabilis</i>	— 515719, 515734, 515737 515784, 515785, 515792
Dark-brown Honeyeater	<i>Lichmera incana griseoviridis</i>	514951, 515046, 515074, 515076, 515693
White-breasted Woodswallow	<i>Artamus leucorynchus</i>	515700
South Melanesian Cuckooshrike	<i>Coracina caledonica</i>	515714
Polynesian Triller	<i>Lalage maculosa</i>	515075
Long-tailed Triller	<i>Lalage leucopyga</i>	514953, 515043, 515695, 515706
Vanuatu Whistler	<i>Pachycephala chlorura intacta</i>	514950, 515038, 515067, 515070, 515698, 515709, 515711, 515712, 515720, 515721, 515723, 515765, 515766
Streaked Fantail	<i>Rhipidura verreauxi spilodera</i>	514956, 515042, 515073, 515708, 515732
Gray Fantail	<i>Rhipidura albiscapa brenchleyi</i>	515039
Buff-bellied Monarch	<i>Neolalage banksiana</i>	515696, 515702, 515733, 515789
Southern Shrikebill	<i>Clytorhynchus pachycephaloides griseescens</i>	515710
Melanesian Flycatcher	<i>Myiagra caledonica marinae</i>	514954, 514955, 515044, 515072, 515078, 515730
Pacific Robin	<i>Petroica multicolor</i> <i>P. m. feminina</i>	— 515694, 515703
Yellow-fronted White-eye	<i>Zosterops flavifrons</i> <i>Z. f. efatensis</i> <i>Z. f. macgillivrayi</i>	— 514952, 515069, 515697 515717, 515722
Island Thrush	<i>Turdus poliocephalus</i> <i>T. p. efatensis</i> <i>T. p. malekulae</i>	— 515701 515724
Common Myna	<i>Acridotheres tristis</i>	515704

Table A3. Local names of birds described by village elders in local languages of Tonalui Village, Éfaté Island; Lingarak Village, Malakula Island; Namasari Village, Gaua Island; and Mosina Village, Vanua Lava Island. The language of Lingarak Village is *Neverver*; other language names were not noted.

Species	Éfaté	Malakula	Gaua	Vanua Lava
<i>Chalcophaps longirostris</i>	Mankafine	—	Mare	—
<i>Ptilinopus greyi</i>	Manmalaksa	—	—	Qasobol
<i>Todiramphus farquhari</i>	Siko	Nasig mblo	—	—
<i>Todiramphus sacer</i>	Siko	Nasig	Wesig	—
<i>Charmosyna palmarum</i>	—	—	Rages	—
<i>Myzomela cardinalis</i>	Laka	Neman bongmial	Quitquitman	Qegetimen
<i>Gliciphila notabilis</i>	—	—	—	Wocol
<i>Lichmera incana</i>	—	Neverula	—	—
<i>Pachycephala intacta</i>	—	—	Wetawas	Tau
<i>Rhipidura verreauxi</i>	Lalaipetau	Levatvat	Watakerekere	—
<i>Neolalage banksiana</i>	Lalaipetau	—	—	Wetibisbis
<i>Clytorhynchus pachycephaloides</i>	—	—	Wetisis	Serser
<i>Petroica multicolor</i>	—	—	—	Watoktokmeme
<i>Zosterops lateralis</i>	Laka	—	Wowerig	Meglewe
<i>Zosterops flavifrons</i>	Laka	Nevelag	—	Meleg
<i>Turdus poliocephalus</i>	—	Nemanbong	Meslala	—
<i>Erythrura regia</i>	—	—	Manvils	—